VOLUME 23

Number 1

R.L. SPROTT	1	Editorial: Biomarkers of aging
J. LABAT-ROBERT and L. ROBERT	5	Mini-review: Aging of the extracellular matrix and its pathology
D.H. PETKOVA, A.B. MOMCHILOVA-PANKOVA, T.T. MARKOVSKA and K.S. KOUMANOV	19	Age-related changes in rat liver plasma membrane spingomyelinase activity
J. ALEMANY, M.J. DE LA CRUZ, I. RONCERO, and J. MIQUEL	25	Effects of aging on respiration, ATP levels and calcium transport in rat liver mitochondria. Response to theophylline
G.A. ADENUGA, A.G. MAZAEV and J.O. OLOWOOKERE	35	The peculiarities of protein and RNA synthesis in the hepatic mitochondria of young and old animals: Studies without the use of an antibiotic
O. SLETVOLD and O.D. LAERUM	43	Alterations of cell cycle distribution in the bone marrow of aging mice measured by flow cytometry
R. ARKING, S. BUCK, R.A. WELLS and R. PRETZLAFF	59	Metabolic rates in genetically based long lived strains of *Drosophila*
	77	Forthcoming articles
	79	Announcements

Number 2

S. HONDA and M. MATSUO	81	Relationships between the cellular glutathione level and in vitro life span of human diploid fibroblasts
E. PIGEOLET, M. RAES, A. HOUBION and J. REMACLE	87	Effect of procaine on cultivated human WI-38 fibroblasts
D. DAYAN, I. ABRAHAMI, A. BUCHNER, M. GORSKY and N. CHIMOVITZ	97	Lipid pigment (lipofuscin) in human perioral muscles with aging
W. D. RUWE, A. M. NAYLOR, C. A. DINARELLO and W. L. VEALE	103	Characteristics of pyrogen fevers are altered in the aged rabbit
P. B. GOLDBERG, N. TUMER and J. ROBERTS	115	Effect of increasing age on adrenergic control of heart rate in the rat

R. M. Ludatscher and M. Silbermann — 127 Abnormalities of intramuscular nerves in old mice: An ultrastructural study

139 Letters to the editor

143 Forthcoming articles

145 Announcements

Number 3

N.W. Shock — 149 Obituary: A. Baird Hastings

E. Gonzalez and S.K. Quadri — 151 Effects of aging on pituitary-thyroid axis in the dog

D. Roy and R. Singh — 161 Age-related change in the multiple unit activity of the rat brain parietal cortex and the effect of centrophenoxine

L. Giovannelli, M.G. Giovannini, F. Pedata and G. Pepeu — 175 Purinergic modulation of cortical acetylcholine release is decreased in aging rats

G.L. Irion, U.S. Vasthare and R.F. Tuma — 183 Preservation of skeletal muscle hyperemic response to contraction with aging in female rats

C.W. Bales, T.A. Davis and R.E. Beauchene — 189 Long-term protein and calorie restriction: Alterations in nucleic acid levels of organs of male rats

D.L. Meisel, Z. Skobe, K.S. Prostak and G. Shklar — 197 A light and electron microscope study of aging parotid and submandular salivary glands of Swiss-Webster mice

R.S. Sohal — 211 Effect of hydrogen peroxide administration on life span, superoxide dismutase, catalase, and glutathione in the adult housefly, *Musca Domestica*

217 Forthcoming articles

219 Announcements

Numbers 4/5

Biomarkers of Aging

R.L. Sprott — iii Preface

George T. Baker, III and Richard L. Sprott — 223 Biomarkers of aging

Ronald W. Hart and Angelo Turturro	241	Biomarkers in aging and toxicity
Gerald E. McClearn	245	Strategies for biomarker research: Experimental and methodological design
George M. Martin	257	Constitutional genetic markers of aging
Tim Tully	269	Response to Dr. George Martin
Robert J. Shmookler Reis	271	Strategies and criteria for the development of molecular biomarkers of senescence
Thomas E. Johnson, William L. Conley and Marilyn L. Keller	281	Long-lived lines of *Caenorhabditis elegans* can be used to establish predictive biomarkers of aging
Vincent J. Cristofalo	297	Cellular biomarkers of aging
Thomas H. Norwood	307	Response to Dr. Vincent Cristofalo
David E. Harrison and Jonathan R. Archer	309	Biomarkers of aging: Tissue markers. Future research needs, strategies, directions and priorities
Karen Reiser	323	Response to Dr. David Harrison
E.R. Stadtman	327	Biochemical markers of aging
J. Meites	349	Neuroendocrine biomarkers of aging in the rat
James F. Nelson	359	Puberty, gonadal steroids and fertility: Potential reproductive markers of aging
Charles J. Mode	369	Mathematical and statistical strategies for biomarker research of aging
Jeffrey B. Halter	377	Endocrine markers of aging
George S. Roth	383	Response to Dr. Jeffrey Halter
William B. Ershler	387	Biomarkers of aging: Immunological events
Edward J. Masoro	391	Physiological system markers of aging
Douglas M. Bowden	395	Response to Dr. Edward Masoro
Dean O. Smith	399	Cellular and molecular correlates of aging in the nervous system
Philip W. Landfield	413	Commentary on biomarkers of aging in the nervous system
Byron A. Campbell and Rick Richardson	417	Effects of chronic dietary restriction on sensory-motor function and susceptibility to stressor stimuli in the laboratory rat
Donald K. Ingram	429	Key questions in developing biomarkers of aging
David L. Wilson	435	Aging hypothesis, aging markers and the concept of biological age

439 Forthcoming articles

441 Announcements

Number 6

RANDOLPH M. NESSE — 445 Life table tests of evolutionary theories of senescence

M.A. HORAN, R.A. LITTLE, N.J. ROTHWELL and M.J. STOCK — 455 Changes in body composition, brown adipose tissue activity and thermogenic capacity in BN/BiRij rats undergoing senescence

RANJAN S. MAITRA, ELIZABETH A. EDGERTON and ADHIP P. NANDI MAJUMDAR — 463 Gastric secretion during aging in pyloric-ligated rats and effects of pentagastrin

JOUNI SIRVIÖ, ANTTI HERVONEN, ANTTI VALJAKKA and PAAVO J. RIEKKINEN — 473 Pre- and postsynaptic markers of cholinergic neurons in the cerebral cortex of rats of different ages

NANCY TELFORD, CHARLES V. MOBBS, HEINZ H. OSTERBURG and CALEB E. FINCH — 481 Alterations in hypothalamic serotonergic-catecholaminergic relationships in aging C57BL/6J mice

E. LE BOURG, F.A. LINTS, J. DELINCE and C.V. LINTS — 491 Reproductive fitness and longevity in *Drosophila melanogaster*

JOHN THOMAS and DENNIS NYBERG — 501 Vitamin E supplementation and intense selection increase clonal life span in *Paramecium tetraurelia*

513 Forthcoming articles

515 Acknowledgments

517 1988 American Federation for Aging Research grant recipients announced

519 Announcements

I Volume 23 Contents

VII Author Index for Volume 23

IX Key Word Index for Volume 23

XI AFAR 1989 grant program for biomedical research in gerontology and geriatrics